U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-277 842

A National Environmental/Energy Workforce Assessment. Delaware

National Field Research Center, Inc, Iowa City, Iowa

Prepared for

Environmental Protection Agency, Washington, D C

Dec 77

PB 277 842

A National Environmental/Energy Workforce Assessment

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Conducted by:

National Field Research Center, Inc.

P.O. Box 287

Iowa City, Iowa 52240

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO. PB277842
4. TITLE AND SUBTITLE A NATIONAL ENVIRONMENTAL/ENERGY WORKFORCE ASSESSMENT, Delaware		5. REPORT DATE December 1977 - Date of Completion 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) National Field Research Center, Inc.		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Field Research Center, Inc. P.O. Box 287 Iowa City, Iowa 52240		10. PROGRAM ELEMENT NO. 2BC651 (36) 11. CONTRACT/GRANT NO. Grant #T900591010
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Federal Activities (A-104) 401 M Street, S.W. Washington, D.C. 20460		13. TYPE OF REPORT AND PERIOD COVERED Phase I Final Report 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES Phase II will comprise approximately five volumes and will be available in September 1978. Phase III will be available in September 1979.

16. ABSTRACT

This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Planning Regional Planning State Planning State Agencies Federal Government Planning Labor Force Manpower Forecasting	Employment Economic Surveys Energy Management Pollution Control Environmental Management Environmental Education Environmental Sciences Conservation Environment	National Environmental/Energy Workforce Assessment	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release Unlimited	20. SECURITY CLASS (This page)	95 22. PRICE PCA05 MFA01

EPA Form 2220-1 (9-73)

NATIONAL ENVIRONMENTAL/ENERGY

WORKFORCE ASSESSMENT

for

DELAWARE

Conducted by:

NATIONAL FIELD RESEARCH CENTER, INC

Under Grant from:

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

Grant #T900591010

1977

This document has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

National
Field
Research
Center, Inc.

Box 287 Iowa City, Iowa 52240 (319) 351-8789

INTRODUCTORY NOTE

The National Environmental/Energy Workforce Assessment was conducted by National Field Research Center, Inc. with main offices in Iowa City, Iowa. The following personnel have had primary responsibility for the Assessment and project report.

IOWA CITY, IOWA
- Dr. Darold E. Albright, President
- Paul E. Bridges, Executive Director
- Dr. Richard L. Benesh, Project Director
- Judith J. Gordon
- Alan M. Stowell
- Anita M. Stowell
- Mary Kay (Edge) Wade

ATLANTA, GEORGIA
- Elizabeth G. Nielsen, Regional Director
- Robert Oxberger

DENVER, COLORADO
- Nancy C. Dillenberg, Regional Director

SEATTLE, WASHINGTON
- Steven Silva, Regional Director

WASHINGTON, D.C.
- Frank E. Smith, Project Coordinator
- Lloyd B. Chaisson, Assistant Project Coordinator
- Jack F. Seum

Additional research and clerical assistance was provided by Frederick M. Wall, Maxine Wolfe, Margaret Fehn, Sandra Hogsed, Karen Kirchoff, Sharon Leiker, Marilyn Low, Mary McCormac, and Joan Urquhart.

FIELD OFFICES

ATLANTA
2700 Cumberland Pkwy
Suite 150
Atlanta, GA 30339
(404) 433-2644

DENVER
2600 S. Parker Rd.
Suite 180, No. 6
Denver, CO 80232
(303) 751-4982

SEATTLE
927 United Pacific Bldg.
1000 2nd Ave
Seattle, WA 98101
(206) 623-9170

WASHINGTON, D.C.
1522 K Street, N.W.
Suite 600
Washington, D.C. 20005
(202) 223-9138

TABLE OF CONTENTS

	Page
ILLUSTRATIONS	iii
ACKNOWLEDGEMENT	v
PREFACE	vi
FOREWORD	vii
STATE SUMMARY	1
STATE PROFILE	14
POLLUTION CONTROL AND ABATEMENT AGENCIES	16
POLLUTION CONTROL AND ABATEMENT PROGRAMS	18
I. Air	19
II. Noise	26
III. Pesticides	31
IV. Potable Water	38
V. Radiation	44
VI. Solid Waste	49
VII. Wastewater	57
VIII. Energy	66
SELECTED POST SECONDARY INSTITUTIONS WITH FORMAL ENVIRONMENTAL/ENERGY PROGRAMS	69
STATE LEGISLATION	74

NOTE: The Selected Bibliography is appended to each Regional Report.

ILLUSTRATIONS

Figure		Page
1	Department of Natural Resources and Environmental Control, Organizational Chart	17
2	Air Pollution Emissions Inventory in Delaware, by County: 1970, 1974	22
3	Department of Agriculture, Division of Production and Promotion, Organizational Chart	37
4	Delaware Solid Waste Disposal Facilities: 1975	56

Table		
I	State of Delaware, Attainment Status of National Ambient Air Quality Standards by Air Quality Control Region	20
II	Delaware Department of Natural Resources and Environmental Control, Air Resources Section, Current (1976) Staffing Level	23
III	Delaware Department of Natural Resources and Environmental Control, Air Resources Section, Workforce Projections to 1982 (est.)	24
IV	State of Delaware, Municipal Noise Ordinances	27
V	Delaware Department of Natural Resources and Environmental Control, Division of Environmental Control, Noise Program, Workforce Projections to 1982 (est.)	29
VI	Delaware Health Department, Potable Water Section, Current (1976) Staffing Level	39
VII	Delaware Department of Natural Resources and Environmental Control, Potable Water Section, Current (1976) Staffing Level	40
VIII	Delaware Health Department, Potable Water Section, Workforce Projections to 1982 (est.)	41

Table		Page
IX	Delaware Department of Natural Resources and Environmental Control	41
X	Delaware Department of Health and Social Services, Office of Radiation Safety, Workforce Projections to 1982 (est.)	46
XI	State of Delaware, Public Sector Solid Waste, Current (1976) Staffing Level	51
XII	State of Delaware, Public Sector Solid Waste, Workforce Projections to 1982 (est.)	53
XIII	Delaware Department of Natural Resources and Environmental Control, Division of Environmental Control, Waste Water Programs, Current (1976) Staffing Level	62
XIV	Delaware Department of Natural Resources and Environmental Control, Division of Environmental Control, Waste Water Programs, Workforce Projections to 1982 (est.)	63

ACKNOWLEDGEMENT

Valuable support and assistance for this report were provided by the Delaware Department of Natural Resources and Environmental Control, the State Department of Agriculture, the Department of Health and Social Services, and the Delaware Solid Waste Authority. Special thanks are extended to Mr. John Bryson, Secretary of the Department of Natural Resources and Environmental Control, for providing valuable insight into the environmental programs in the state. Mr. John Egan, Director, and Mr. Jim Pase, both of the Division of Environmental Control, Department of Natural Resources and Environmental Control, were particularly helpful in providing information on the waste water program in the state. Of equal importance was the assistance of Mr. N. C. Vasuki, Manager of the Delaware Solid Waste Authority, in the area of solid waste. Appreciation is also extended to Mr. Robert French, Manager of the Air Resources Section, Division of Environmental Control, of the Department of Natural Resources and Environmental Control; Mr. Robert Berry, Director of the Division of Production and Promotion of the Department of Agriculture; Mr. Donald Harmeson, Chief of the Bureau of Environmental Health, Division of Public Health, of the Department of Health and Social Services; and Mr. David Hume, Deputy Attorney General of the Department of Natural Resources and Environmental Control.

PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976 - 1981) based on available information for the State of Delaware in the environmental pollution control areas of air, noise, pesticides, potable water, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center, Inc. of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material herein contains the information and data collected for eight individual pollution control inventories conducted for Delaware. The format includes workforce profiles, projections, growth, and career potential for each of the areas investigated. Growth projections are necessarily based on best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution control areas considered by this study are as follows:

Air

Noise

Pesticides

Potable Water

Radiation

Solid Waste

Waste Water

Energy

National Environmental Energy Workforce Assessment

Phase I

DELAWARE

State Summary

I. AIR

Air pollution control and abatement activities in Delaware are the responsibility of the Air Resources Section within the Department of Natural Resources and Environmental Control. Delaware's air pollution control program has a current staffing level of 24 persons, whose activities include the development and monitoring of state air pollution control regulations. Most of the Section's engineers are chemical engineers. Over half of the Air Resources Section is staffed with technicians.

Program officials have indicated that a staffing increase of about eight percent per year can be expected over the next five years. Greatest demand will continue to exist for technicians, but the number of actual new jobs will be small because of the current size of the program. Officials believe that Delaware will promulgate regulations for auto emissions, and the program may lead to a maintenance/inspection program.

II. NOISE

Delaware's environmental noise control program is under the jurisdiction of the Division of Environmental Control of the Department of Natural Resources and Environmental Control. The Department shares some authority for noise control with the Department of Public Safety, which has responsibility for vehicular noise.

Although there is no current staff, an initial workforce is anticipated to be six persons, who are occupationally categorized as engineers, technicians, and clerks. In addition, the division expects to utilize the services of a staff attorney, who would work approximately half time in noise control enforcement. The division desires to employ engineers with backgrounds in mechanical, environmental, or industrial engineering, with some training in acoustics being desirable. The technicians will be classified as Environmental Protection Officers, and the technicians plus the attorney make up the enforcement area, which consists of response to citizens' complaints.

Officials in the Division of Environmental Control project a modest increase in staffing levels over the next five years. Three persons may be recruited for noise control activities by 1981. Two persons are needed for additional enforcement activities and the third would be an engineer, preferably with a background in mechanical, industrial, or environmental engineering. With an anticipated increase in enforcement activities, career potential will be greatest for technicians working in enforcement.

III. PESTICIDES

Responsibility for pesticide usage and control in Delaware is with the State Department of Agriculture. The pesticide program is in the Division of Production and Promotion. The current staffing of the pesticide program consists of two persons, both clerical, whose responsibilities consist of the registration and licensing of pesticides and pesticide products.

As of January 1, 1977, program officials indicated that 96 commercial applicators had been trained, and 1,108 private applicators had received training, although none had been certified. There are approximately 3,500 farmers in Delaware, and it is anticipated that about 1,300 will need to be certified. An additional 400 commercial applicators will also require certification.

Program officials indicate that three additional persons will be needed for the program by the time registration and certification programs are completed (estimated to be in late 1977). The three will be full-time pesticide field inspectors to fulfill FIFRA requirements. It is possible that technicians with two-year degrees may be utilized for these positions.

The pesticide program in Delaware has only recently been revised to conform with the federal requirements under FIFRA. Training and certification programs are just getting underway, and it is estimated that, when certification procedures are completed, only small increases in certified applicators will occur.

IV. POTABLE WATER

Responsibility for the conduct of Delaware's potable water program is shared by the Bureau of Environmental Health of the State Health Department and the Division of Environmental Control of the Department of Natural Resources and Environmental Control. The program's activities are concerned with the implementation and enforcement of the federal Safe Drinking Water Act (SDWA). The state has assumed primacy under the act for its implementation and enforcement.

The current staffing level of the potable water program consists of a total of sixteen people. Seven of the people are located in the Health Department, three of which are classified as sanitarians, a professional position which requires a bachelor's degree. Those currently employed in this position have bachelor's degrees in biology and agricultural science. The two positions classified as technicians are water supply aides, positions which do not require a high school education. The remaining nine persons are located in the Department of Natural Resources and Environmental Control, and professionals represented include geologists and hydrologists.

Within both the Health Department and the Department of Natural Resources and Environmental Control, the programs are expected to double in size. Most of the opportunity will be for professionally trained persons, particularly engineers, sanitarians, and scientists such as geologists. There will also be some limited potential for non-professional persons trained as technicians.

V. RADIATION

The Delaware Department of Health and the Social Services Division of Public Health has administrative responsibility for the state's radiation program through the Office of Radiation Safety. At present, the radiation program is involved in limited environmental monitoring (inspection) activities.

At the state level, there are only two persons currently working in the radiation program. One is a physicist, and one is an X-ray technician. Both are involved in X-ray inspection activities. Professionals currently employed in the program anticipate an increase of seven or eight people at the state level by 1982. At least two more degreed radiological health professionals are needed by 1978. Also, one person is expected to be acquired from the federal government on a loan basis in the next five years.

Activities in the area of nuclear power and radioactive waste disposal are expected to pick up once construction plans for two nuclear power stations in the state advance beyond the review stage. Once in operation, the power plants currently under review can be expected to provide a substantial number of jobs for nuclear engineers, scientists, and technicians. The development of nuclear power in the state will also affect the number of jobs available in radioactive waste disposal.

VI. SOLID WASTE

In 1975, the Delaware legislature created the Delaware Solid Waste Authority to provide the state with comprehensive solid waste management services. The Authority is specifically charged with the development and implementation of a statewide solid waste management plan and the establishment of a program for the maximum recovery and reuse of materials and energy resources derived from solid waste. This legislation also transferred the licensing powers of the Department of Natural Resources and Environmental Control for hauling, conveying, and transporting solid wastes to the Authority, although the Department retains regulatory control over the program.

Delaware's solid waste program currently has a staffing level of nine persons. They are divided between the Solid Waste Authority and the Department's Division of Environmental Control. The Division employs a sanitary engineer, a chemical engineer, and a secretary to manage the program. The Authority is staffed with six persons and two, including the Director, are engineers with training in sanitary and chemical engineering. One is a planner, and the remaining three positions are clerical.

Officials in the Solid Waste Authority expect an increase to 14 persons over the next five years. With the beginning of operation of the state's resource recovery facility in 1981, opportunities will exist for operating personnel. There should also be opportunities developing in the private sector, since much of the state's activities in this area will be contracted.

VII. WASTE WATER

The waste water program in Delaware is under the jurisdiction of the Division of Environmental Control of the Department of Natural Resources and Environmental Control. The U.S. EPA has delegated authority to the Department for issuing the National Pollutant Discharge Elimination System (NPDES) permits.

The waste water program consists of 36 people in the Division of Environmental Control. Positions include engineers, planners, lab technicians, technicians, and clerks. The engineers are chemical and sanitary engineers with professional training in those disciplines. The two planners are professionals with backgrounds in the physical or natural sciences. Those persons holding technician positions are not required to have college degrees, although some college training is considered desirable.

Within the state program, only nine additional positions are anticipated over the next five years. Although most of these will require professionally trained persons with backgrounds in engineering or the natural sciences, significant technician opportunities are expected to exist for those who do not have college degrees.

Delaware has no operator certification or comprehensive training program at the present time. It is estimated that both of these activities will be initiated within the next year or two in an effort to upgrade the operations of waste water treatment plants.

VIII. ENERGY

Energy Office functions in Delaware are jointly administered by the Division of Emergency Planning and Operations under the Department of Public Safety and the newly created Governor's Energy Commission. The Division of Emergency Planning and Operations has now become primarily responsible for fuels allocations,whereas the Commission now has responsibility for energy conservation planning.

Since the change over of administrations in Delaware's state government, the new Governor has appointed a Governor's Energy Advisor to serve as Executive Director of his Governor's Energy Commission which prepares energy conservation plans. The commission is also made up of Governor-appointed members from the private sector in the state.

The director of the Division now has responsibilities only for fuels allocations and management of the state set-aside supplies. This person is the only person in the Division with this responsibility. The Governor's Energy Advisor along with a secretary are the only two full-time state employees with energy conservation planning responsibilities. The state thus has three persons total with energy-related planning jobs on the state level in Delaware.

Assuming that the state's energy conservation plan is accepted by the U.S. Federal Energy Administration (FEA) and funds are made available to hire additional personnel to implement the proposal, four full-time planners, with managerial expertise, may be hired by the Commission to implement the plan.

STATE OF DELAWARE - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	24	25	28	29	32	33	7%
NOISE[2]	6	7	9	9	10	10	11%
PESTICIDES[3]	2	5	5	5	5	5	30%
POTABLE WATER[4]	16	19	23	27	31	36	18%
RADIATION[5]	2	2	6	6	7	8	46%
SOLID WASTE[6]	9	9	13	15	21	21	20%
WASTEWATER[7]	36	36	39	39	45	45	5%
ENERGY[8]	3	7	7	7	7	7	27%
TOTALS	92	110	130	137	158	165	12%

[1]The above represents only state agency personnel.

[2]The above does not include law enforcement agencies or the private sector for which figures were not available.

[3]The above includes state program personnel, but does not include an estimated 400 commercial and 1300 private applicators who will require certification.

[4]The above does not include water supply and water treatment plant operators for which figures were not available.

[5]The above includes only state agency personnel.

[6]The above does not include private sector personnel for which figures were not available.

[7]The above does not include an estimated 250 wastewater treatment plant operators for which projections were not available.

[8]The above includes only state energy planning personnel.

EDUCATION

Two post-secondary educational institutions in the State of Delaware offer career options in environmental studies: University of Delaware and Delaware Technical and Community College at Stanton. A Master of Education degree in Population and Environmental Education is available through the University of Delaware. In addition to this degree program, the University is a principal sponsor of the Coastal/Oceanic Awareness Study Program. The program is a multidiciplinary learning program designed to increase elementary and secondary students' knowledge of marine and coastal environments.

An Associate of Science degree in Environmental Engineering Technology is available through the Delaware Technical and Community College at Stanton. Curricula materials emphasize numerous environmental disciplines including solid waste, air and water pollution, and environmental health.

Most post-secondary educational institutions in Delaware offer select courses in environmental disciplines through their existing department structures. Such courses include Man and Environment, Ecology, Plant Science, Meteorology, and Civil Engineering. Nevertheless, other than the two previously mentioned programs available through the University of Delaware and the Delaware Technical and Community College at Stanton environmental degree career options are scarce.

LEGISLATION

The environmental/energy legislation for Delaware was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Act

Noise Control Act

Pesticide Law

Solid Waste Authority Act

Coastal Zone Act

Beach Preservation Act of 1972

Underwater Lands Act

Wetlands Act

National Environmental Energy Workforce Assessment

Phase I

DELAWARE

State Report

STATE PROFILE

Delaware, which encompasses 2,057 square miles, is the second smallest state. It is part of the Washington, D.C.-Boston urban corridor along the Middle Atlantic Seaboard. Most of Delaware's 575,000 population is in the north, in and around Wilmington where the state's industry is concentrated and major highways and railroads pass. Delaware is 96 miles long and varies from 9 to 35 miles wide; it occupies part of the Delmarva peninsula separating the Chesapeake and Delaware bays.

The per capita income is $6,799, third highest in the nation. The liberal incorporation laws have made Delaware the nominal home state for many major businesses. Major industries are petrochemical processing, machine and transportation production, canning and frozen food processing, leather, metal, and textile products. The value added by manufacture is $1.5 billion. Manufacturing employs 34.1 percent of the workforce; trade, 23.2 percent; and state services, 15.1 percent.

Delaware's farms have decreased in number for the past century; net income per farm is twice the national average. Broiler chickens bring in the largest amount of farm income; corn and soybeans are also grown. Agricultural receipts for 1975 totaled $279 million. Mineral production, limited to sand, gravel, and building stone,accounted for $4.8 million in 1975. The 1975 commercial fishing catch was valued at $1.6 million. Tourists, drawn to beaches, racetracks, historical sites, and museums, brought in $158 million.

Population growth looms as a major issue in Delaware's future. By 1985,Delaware is projected to have a population of 697,600. The state's population increased 40 percent between 1950 and 1960, and grew 23 percent during the 1960s. Reapportionment of representation in the Delaware legislature has broken the hold of the farm interests so that the Wilmington area is now more fairly represented. This shift is expected to have a major effect on the direction of future decisions regarding economic development and land use, matters which will have critical impact on the state in the 1980s.

DELAWARE POLLUTION CONTROL AND ABATEMENT AGENCIES

The Department of Natural Resources and Enviromental Control, the Department of Health and Social Services, and the Department of Agriculture all share administrative authority for Delaware's pollution abatement and control programs.

The Department of Natural Resources and Enviromental Control has six major components, including the Office of Administration, the Office of Information and Education and four divisions: The Division of Fish and Wildlife, the Division of Parks and Recreation, the Division of Soil and Water Conservation, and the Division of Environmental Control. The Division of Environmental Control has responsibility for the Department's pollution control and abatement activities and incorporates a Technical Services Section with analytical laboratory capabilities. This division has direct administrative responsibility for the state's water quality and solid waste programs, through the Water Resources Section, the noise program and the air quality program through the Division's Air Resources Section.

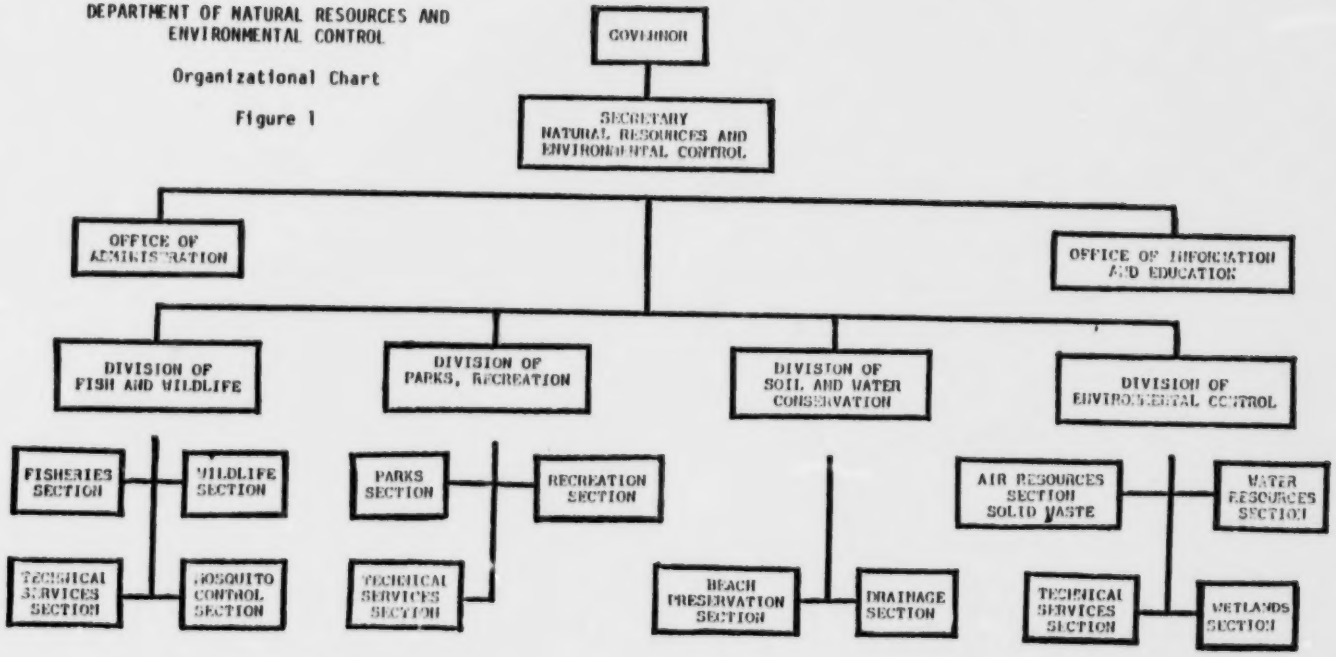
The Delaware Department of Health and Social Services' Division of Public Health administers the state's radiation program through the Office of Radiation Safety of the Bureau of Environmental Health, which is one component of the Community Health Section. The Bureau of Environmental Health also assures responsibility for the state's water supply program.

Activities dealing with pesticide control in the state of Delaware are administered through the Division of Production and Promotion of the state's Department of Agriculture.

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Organizational Chart

Figure 1



Pollution Control and Abatement Programs

I. AIR

A. Introduction

Air pollution control and abatement activities in Delaware are the responsibility of the Air Resources Section within the Department of Natural Resources and Enviromental Control. The program actually began in 1972 when regulations governing air pollution control became effective. These regulations established the program activities that are carried out by the Section and include:

- requiring the registration of air containment sources;
- establishing ambient air quality standards;
- setting particulate emissions standards for fuel burning equipment, industrial operations, construction and materials handling, incineration, and grain handling;
- setting sulfur dioxide emissions from fuel burning equipment and industrial operations;
- establishing standards for opening burning;
- setting standards for visible emissions from stationary sources
- establishing an air pollution alert and emergency plan;
- controlling interstate sources; and
- controlling odorous air contaminates.

There are two Air Quality Control Regions (AQCR) in Delaware as provided for in the State Implementation Plan (SIP). Table I below lists the AQCR's and their attainment status of national ambient air quality standards as of June 30, 1976, as provided by EPA's State Air Implementation Plan Progress Report. The report also indicates that the state's New Source Review and Emission

TABLE I

STATE OF DELAWARE

Attainment Status of National Ambient Air Quality Standards
by Air Quality Control Region[1]

AQCR \ Pollutant	TSP	SO_2	CO	O_x	NO_2
045. Metropolitan Philadelphia Interstate (Delaware portion)	X			AR	
046. Southern Delaware				AR	

[1]"X" indicates non-attainment of an applicable NAAQS, but no call for a SIP revision.

"AR" indicates non-attainment of an applicable NAAQS and a call for a SIP revision for attainment and maintenance.

"MR" indicates attainment of an applicable NAAQS, however, a SIP revision for maintenance is necessary.

A blank indicates attainment of an applicable NAAQS and no calls for SIP revisions.

Limitations standards have been approved. There are no transportation Control Plans in Delaware.

Figure 2 compares the amounts of major pollutants emitted in Delaware by type of polluting facility in 1970 and 1974. As of June, 1976, there were 53 major polluting installations (capable of emitting over 100 tons of a pollutant each year) in the state. Of these, 52 were in compliance with the state law, and one was in violation. Figure 2 was provided by the Delaware Department of National Resources and Environmental Control.

B. Workforce Profile

The information for this section was obtained primarily through on-site interviews with professionals working in the air pollution control program and from various materials and documents supplied by them.

Delware's air pollution control program has a current staffing level of 24 persons, whose activities include the development and monitoring of state air pollution control regulations. As indicated in Table II, a majority of the program, 13 persons, is composed of technicians. These positions require only a high school education, although program professionals indicated that some work experience or college training is desirable. The technicians are primarily involved in monitoring activities.

Figure 2

AIR POLLUTION EMISSIONS INVENTORY IN DELAWARE, BY COUNTY: 1970, 1974
(Tons)

Principle Classes of Pollutants Being Discharged	Total Weights of Discharge		Processing		Incineration		Mobile		Residential		Commercial, Institutional, Governmental		Fuel Combustion: Industrial		Fuel Combustion: Power Generation		Fuel Combustion: Total Fuel	
	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974	1970	1974
DELAWARE																		
Sulfur Oxide	231,586	105,110	51,914	24,317	6.3	2.5	887	1,096	3,394	4,222	2,046	3,339	35,895	15,145	137,444	56,989	178,779	79,695
Nitrogen Oxide	52,864	67,646	370	370	10.0	4.7	12,779	12,427	4,416	5,620	938	1,725	10,321	8,974	24,030	38,526	39,706	64,845
Carbon Monoxide	537,573	212,939	280,768	5,584	131.9	57.0	253,848	204,673	1,878	2,389	39	6	432	22	476	208	2,826	2,625
Hydrocarbon	61,670	46,116	7,131	6,242	18.1	9.2	51,659	36,430	1,914	2,436	31	66	549	454	307	482	2,863	3,435
Particulate	43,756	32,585	12,888	1,240	19.2	5.0	1,316	1,619	1,597	2,028	147	490	4,884	2,333	22,906	24,870	29,533	29,721
KENT																		
Sulfur Oxide	4,274	5,529	0	0	.6	0.3	167	207	545	879	836	2,770	176	456	2,549	1,217	4,106	5,322
Nitrogen Oxide	4,316	6,360	0	0	1.1	0.5	2,559	2,449	723	1,167	207	1,423	65	261	759	1,060	1,756	3,911
Carbon Monoxide	51,693	42,845.5	0	0	7.7	3.5	51,360	42,344	305	492	4	4	1	1	16	1	326	498
Hydrocarbon	11,063	8,336	0	0	1.7	0.8	10,734	7,719	315	509	6	54	2	11	6	42	329	616
Particulate	1,634	1,474.5	112	112	1.8	0.5	337	412	251	404	60	406	13	70	860	71	1,183	950
NEW CASTLE[1]																		
Sulfur Oxide	189,602	91,908	51,914	24,317	5.3	2.0	545	700	2,307	2,762	1,034	569	27,271	11,740	106,525	51,818	137,138	66,889
Nitrogen Oxide	36,387	39,581	370	370	8.2	4.0	7,813	7,674	2,974	3,682	685	302	7,706	7,191	16,831	20,358	28,197	31,533
Carbon Monoxide	434,976	128,565	280,766	5,582	116.8	50.0	152,326	121,238	1,269	1,671	35	2	159	17	306	105	1,768	1,696
Hydrocarbon	38,660	29,925	6,242	6,242	15.5	8.0	30,594	21,283	1,285	1,691	22	12	200	383	231	406	1,809	2,392
Particulate	39,140	73,726	12,663	1,016	15.8	4.0	734	943	1,097	1,358	75	85	3,644	1,831	20,912	8,489	25,727	11,763
SUSSEX																		
Sulfur Oxide	37,710	7,673	0	0	0.4	0.2	1,175	189	176	581	542	0	8,448	2,949	28,370	3,954	37,535	7,484
Nitrogen Oxide	12,161	21,705	0	0	0.5	0.2	2,407	2,304	45	771	719	0	2,550	1,622	6,439	17,108	9,733	19,401
Carbon Monoxide	50,903	41,528.5	2	2	7.3	3.5	50,163	41,091	0	326	304	0	273	4	155	102	731	432
Hydrocarbon	11,945	7,855	889	0	0.9	0.4	10,330	7,428	3	336	314	0	340	57	69	34	725	427
Particulate	2,983	17,384.5	113	112	1.7	0.5	245	264	13	266	249	0	1,227	432	1,134	16,310	2,623	17,008

[1] 1970 figures are actually 1969 data.

Source: Division of Environmental Control, Department of Natural Resources and Environmental Control, State of Delaware.

Seven persons in the program are engineers; most are chemical engineers. Job requirements indicate that a four-year degree in one of the engineering sciences is required for the position. Program officials indicated that chemical engineers had good backgrounds for the types of activity of the air pollution program. Those persons listed as "other" in the table are clerical employees.

TABLE II

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Air Resources Section
Current (1976) Staffing Level

Position	1976
Engineer	7
Technician	13
Other	4
TOTAL	24

C. Workforce Projections

Figures in this section are based on the best professional judgements of personnel working in the state's Air Pollution Control Program,and they represent growth within the recent past.

Program officials have indicated that a staffing increase of about 8% per year can be expected over the next five years. Projections are based on an anticipated increase of federal and state regulations. Officials estimated that eventually the state will promulgate regulations on auto emissions.

Staffing increases are expected to occur at about the same rates for each of the occupational categories. Greatest demand will continue to exist for technicians, but the number of actual new jobs will be small because of the current size of the program. No changes are anticipated in the requirements for persons filling these positions. Projections are illustrated in Table III.

Turnover is anticipated by program officials to be very low and, as a result, is not applicable to the table. Turnover in the program was a factor until last year when salaries were upgraded, discouraging professionals from leaving for positions in private industry.

TABLE III

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Air Resources Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	7	7	8	8	9	10	N/A	8%
Technician	13	14	15	16	17	17	N/A	6%
Other	4	4	5	5	6	6	N/A	9%
TOTAL	24	25	28	29	32	33		7%

D. Training and Certification

The only formal training done by the office is a smoke readers' course conducted by the engineers in the program for other state and local air pollution control officials. Besides this, the only training conducted is informal on-the-job training for new employees to acquaint them with the state air pollution control law, regulations,

and operation of the program. Program professionals indicated support for EPA sponsored training programs and would like to see them increased. In Fiscal Year 1976, five persons from Delaware attended courses offered by EPA's Air Pollution Training Institute at Research Triangle Park, North Carolina.

E. Career Potential

The potential for careers in Air Pollution Control and Abatement in Delaware will be very limited. This is due to the small size of the program. Even though an 7% per year increase in staffing is forecast for the next five years, this will result in few additional jobs. Opportunities that do exist will be for both professionals with four year degrees and for techinicians, who will not require degrees.

F. Conclusion

Delaware's Air Pollution Control and Abatement Programs are the responsibility of the Air Resources Section. The current staff of 24 persons is involved in the development and monitoring of regulations. An increase in staffing, due to the increasing number of regulations, is anticipated over the next five years. This will, however, result in few additional jobs,but opportunities that do exist will require both professional and technical personnel.

II. NOISE

A. Introduction

Delaware's environmental noise control program is under the jurisdiction of the Division of Environmental Control of the state's Department of Natural Resources and Environmental Control. The Department shares some authority for noise control with the Department of Public Safety, which has responsibility for vehicular noise.

The statutory authority for noise control in the state is the Delaware Noise Control Act enacted in 1976. The Act authorizes the Department of Natural Resources and Environmental Control to adopt regulations and standards for the control of non-vehicular noise and inspection of noise control equipment. It also provides for the development of statewide noise control education programs and requires the registration of persons involved in operations resulting in excessive noise. The Department of Motor Vehicles is authorized to adopt regulations for test procedures, instrumentation, and inspection of vehicular noise control equipment. The Department of Public Safety must obtain approval from the Department of Natural Resources and Environmental Control before adopting any noise regulations. The law also establishes a Noise Control Council within the Natural Resources Department,which is an advisory body to study and investigate noise activities and make recommendations for the implementation and improvement of the program. The Council consists of thirteen members,including the Director of the Consumer Affairs Division; the Secretaries of the Departments of Health and Social Services, Labor, Public Safety, Natural Resources and Environmental Control; and the

Director of the Division of Motor Vehicles. Seven other members are appointed by the Governor and are required to include a medical doctor, an industrialist, an ecologist, and a mechanical engineer.

The Noise Control Act protects the right of municipalities and county boards of health to adopt ordinances, resolutions, or regulations to establish standards for community noise that are more stringent than the state law. This allows communities to adopt standards to meet local needs. In Delaware, only the city of Wilmington has adopted local ordinances as indicated in Table IV. This information was excerpted from Sound and Vibration Magazine, December 1976, (Clifford Bragdon).

TABLE IV

STATE OF DELAWARE

Municipal Noise Ordinances

Jurisdiction	1970 Population	Nuisance	Zoning	Vehicle	Rec/ Vehicle	Railroad	Aircraft	Construction	Building
DELAWARE									
Wilmington	80,386	0	X	X	-	-	-	-	-

Key: X - Regulations including acoustical criteria
0 - Regulations not including acoustical criteria

B. Workforce Profile

Information on staffing levels for the Delaware noise control program was obtained primarily from on-site interviews with professionals working on the program. Figures represented are for those persons regarded by program officials as being necessary for implementation of the law.

The first year's budget request was for six full-time persons. These are occupationally categorized as two engineers, two technicians,

and two clerical employees. In addition, the Division expects to utilize the services of a staff attorney working approximately half-time in noise control enforcement. The Division desires to employ engineers with backgrounds in mechanical, environmental, or industrial engineering, with some training in acoustics being desirable. The technicians will be classified as Environmental Protection Officers and must meet the same standards as those for state police officers. The technicians and the attorney will make up the enforcement area of the program, which consists primarily of response to citizens' complaints.

The local ordinances in Wilmington are generally enforced in a manner similar to that of the state. Local enforcement is a police function and relies chiefly on response to citizen complaints.

C. Workforce Projections

Officials in the Division of Environmental Control estimate a modest increase in staffing levels over the next five years. As Table VI shows, an additional three persons are anticipated in 1981. Of these three, two would be technicians needed for additional enforcement activities, and the third would be an engineer, preferably with a background in mechanical, industrial, or environmental engineering. The legal and clerical personnel would remain constant.

The primary reason given by officials for the small increase in number of personnel is the lack of federal funding available to the state for support of the program. The projections in Table V are based on past experience of the Department and the assumption that no large federal commitment will be forthcoming in the next five years.

With significant federal monies, professionals indicate that the program could increase by one and one half times its current level by 1981. Turnover is not significant to this program because of the small number of personnel.

TABLE V

DELAWARE DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

Division of Environmental Control
Noise Program
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	0	2	3	3	3	3	n/a	13%
Attorney	0	0.5	0.5	0.5	0.5	0.5	n/a	n/a
Technician	0	2	3	3	4	4	n/a	17%
Other	0	2	2	2	2	2	n/a	n/a
TOTAL	0	6.5	8.5	8.5	9.5	9.5	n/a	9%

D. Training and Certification

No formal training or certification programs exist in noise control. New personnel in the Division are provided with informal on-the-job training to acquaint them with the state noise regulations and a general background in noise problems. The state law stipulates that a noise control education program be developed and that persons involved in operations resulting in excessive noise be registered. The law had just been enacted as this survey was being made, and the implementation of these activities had not begun. It is anticipated, however, that the education program will be conducted by program professionals to acquaint local police and enforcement officials with the law and

enforcement responsibilities. Registration will be required primarily for commercial and industrial activities, but it is not anticipated to require any additional personnel in those establishments to comply with registration requirements.

E. Career Potential

Because of the small increase of personnel anticipated in noise control over the next five years, no new careers are expected to develop. Federal funds could result in an increased number of program personnel, but the demand will continue to be for engineers and technicians. With an anticipated increase in enforcement activities, career potential will be greatest for technicians working in enforcement.

F. Conclusion

The noise control program in Delaware is relatively new, with the passage of the Noise Control Act in 1976. An initial workforce of 6.5 persons is anticipated and only a moderate increase is expected over the next five years. A lack of federal funding is the major reason for the small number of personnel. The program will utilize engineers and technicians and it is estimated that these persons will continue to be in demand with a particular need for technicians in enforcement activities.

III. PESTICIDES

A. Introduction

Responsibility for pesticide usage and control in Delaware is with the State Department of Agriculture. The pesticide program is in the Division of Production and Promotion, one of two divisions in the Department as indicated on the organization chart following this section.

A pesticide law was first enacted in Delaware in 1971. Following the federally mandated state requirements of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), the Delaware legislature amended the state law to bring it into compliance with FIFRA. The new act is effective January 1, 1977.

The law created a Pesticide Advisory Committee within the Department of Agriculture, consisting of:

- three pesticide applicators, one qualified to operate ground equipment, one qualified to operate aerial equipment, and one qualified for structural pest control;
- one entomologist;
- one environmental health specialist;
- one toxicologist;
- one plant pathologist;
- one member from the agricultural chemical industry;
- one member from the food processing industry;
- one producer of agricultural crops on which pesticides are applied or may be affected by application of pesticides;
- two representatives from the Department of Natural Resources and Environmental Control.

The committee is responsible for advising the Department of Agriculture on problems relating to use and application of pesticides in the state.

The law requires that no restricted pesticide be purchased or used without a permit and that disposal of restricted pesticides be in accordance with state regulations. The law also requires the certification of private and commercial applicators. The state will certify ten categories of commercial applicators to include:

1) Agricultural Pest Control
   a) Plant
   b) Animal
2) Forest Pest Control
3) Ornamental and Turf Pest Control
4) Seed Treatment
5) Aquatic Pest Control
6) Right-of-Way Pest Control
7) Industrial, Institutional, Structural and Health Related Pest Control
   a) Fumigation
8) Public Health Pest Control
9) Regulatory Pest Control
10) Demonstration and Research Pest Control

The state will also provide five types of certificates available to the private applicator. The type of certificate is optional to the applicator and includes:

1) General Certification
2) Pesticide Class Certification

3) Commodity/Crop/Site Certification

4) Single Product Certification

5) Single Product/Single Use Authorization (only available as an emergency provision)

B. Workforce Profile

Information for this section was provided through on-site interviews with professionals working in the pesticide programs and the use of materials and documents supplied by them.

The Department of Agriculture administers the pesticide program through three functions assigned to it:

1) Registration of all pesticides sold within the state;

2) Issuance of permits for use of restricted use pesticides;

3) Implementation of an educational program on pesticides.

The current staffing of the pesticide program consists of two persons, both clerical, whose responsibilities consist of the registration and licensing of pesticides and pesticide products. It is estimated that there are almost 5,000 such products to be registered. At the time of this study, the certification program had not yet begun. Professionals estimated that training in preparation for certification would begin in November, 1976, and continue through mid-1977. As of January 1, 1977, program officials indicated that 96 commercial applicators had been trained and 1,108 private applicators had received training, although none had been certified. There are approximately 3,500 farmers in Delaware and it is anticipated that about 1,300 will need to be certified. An additional 400 commercial applicators will also require certification.

C. Workforce Projections

Data obtained for this section are from on-site interviews with program professionals and represent the best professional judgements of those persons.

Program officials indicated that three additional persons will be needed for the program by the time that registration and certification programs are completed (estimated to be in late 1977). The three would be full-time pesticide field inspectors to fulfill FIFRA requirements. Persons with four-year degrees in agriculture would probably be hired for the positions, but officials indicated the possibility of some potential for technical persons with two-year degrees to fill these jobs. It is regarded as likely that these positions will be provided by the state. If they are not, agricultural product inspectors, already employed by the Agriculture Department, will probably be given the pesticide inspection program as a part-time responsibility. After the initial increases, the program staffing level is expected to remain constant for the foreseeable future.

After the expected certification of 400 commercial applicators and 1,300 private applicators, projections of future applicator requirements are difficult to ascertain. It is anticipated by program officials that any increase that occurs will be extremely small. Turnover among personnel in the commercial applicator category will account for some increase in future certification, but very little turnover is expected among private applicators, most of whom are farmers.

D. Training and Certification

No formal or informal training is provided by the program itself. This is due primarily to the small staffing level of the program. A

training program for commercial and private applicators is currently underway and is being conducted by the University of Delaware Extension Service. The training is based on training manuals developed or approved by EPA.

E. Career Potential

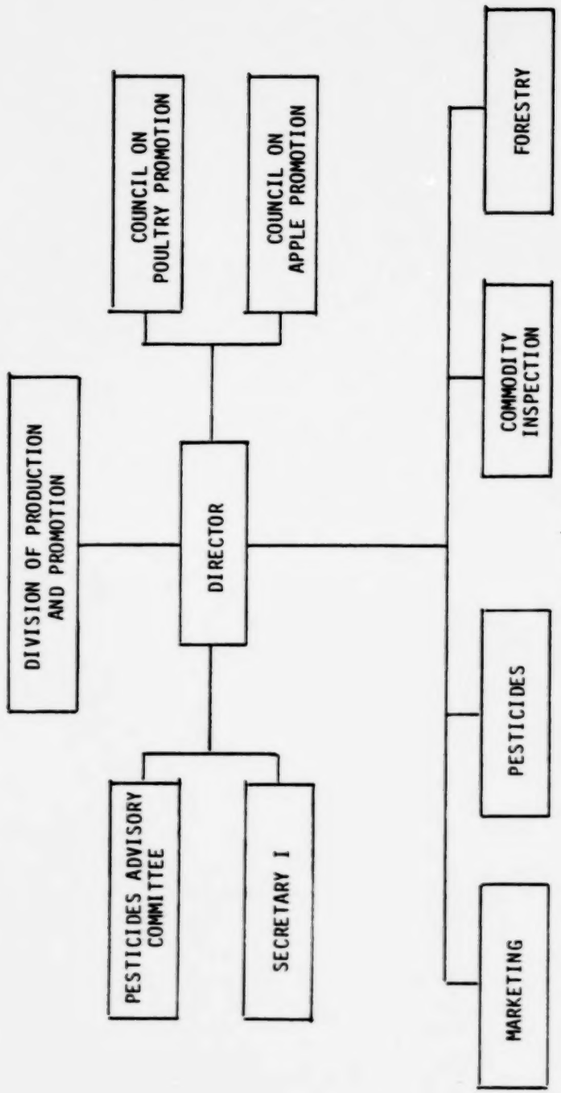
Little potential is anticipated for careers in pesticides at the state level. Only three additional positions are expected in the foreseeable future, and they will be for field inspectors, most likely requiring a four-year degree in agriculture. It is possible that technicians, with two-year degrees, may be utilized for these positions.

Career opportunities for commercial applicators are difficult to predict, since no projections of workforce growth in this area are available; since this is the area with greatest personnel turnover, it can be assumed that the greatest career potential exists here. Other career possibilities may be available in the fields of integrated pest management and pesticide disposal, but figures are not available to provide information on the types of job or numbers of people that might be required.

An exception is a U.S. Department of Agriculture study done in 1972, which indicated the potential manpower requirements for integrated pest management to be about 240 persons in Delaware. Most of these persons would be field scouts, a position requiring a high school education and some knowledge of entomology. The remaining persons would be professional crop protection specialists with backgrounds in the physical sciences. The Agriculture Department based its figures on one field scout per 2,000 acres of cropland and one crop protection specialist per 30,000 acres.

F. Conclusion

The pesticide program in Delaware has recently been revised to conform with the federal requirements under FIFRA. Training and certification programs are just getting underway,and it is estimated that when certification procedures are completed, only small increases in certified applicators will occur. The state program currently consists of two people. It is anticipated that three more persons, field inspectors, will be added and that the program will remain constant at that level.



DEPARTMENT OF AGRICULTURE
DIVISION OF PRODUCTION AND PROMOTION
Organizational Chart

Figure 3

IV. POTABLE WATER

A. Introduction

The objective of Delaware's water supply or potable water program is to ensure that all public water supplies provide safe and sanitary drinking water to all citizens. Responsibility for the Administration of the program is shared jointly by the Bureau of Environmental Health of the State Health Department and the Division of Environmental Control of the Department of Natural Resources and Environmental Control.

The program's activities are concerned with the implementation and enforcement of the federal Safe Drinking Water Act (SDWA). The Act mandates U.S. EPA to establish National Primary Drinking Water Regulations, provides assistance to the states, and protect underground sources of drinking water. The State of Delaware has assumed primacy under the Act for its implementation and enforcement.

The Act also stipulates that each public water supply is required to monitor, test, and otherwise operate in compliance with the regulations. Of immediate concern to the program is the bringing of community sources of supply into compliance. Program officials have indicated that there are about 200 community sources in Delaware.

B. Workforce Profile

The information contained in this section was obtained primarily through on-site interviews with professionals working in the Potable Water Program and through various materials and documents supplied by them.

The current staffing level of the Potable Water Program consists of a total of sixteen people. Seven of these persons are located in the Health Department as illustrated in Table VI. Three of these persons are classified as Sanitarians, a professional position which requires a bachelors degree or an associate degree plus two years of relevant work experience. Those currently employed in these positions have bachelors degrees in biology and agricultural science. The two positions classified as technicians are Water Supply aides, positions which do not require a high school education. The position classified as "other" is a secretary.

TABLE VI

DELAWARE HEALTH DEPARTMENT

Potable Water Section
Current (1976) Staffing Level

Position	1976
Sanitarian	3
Technician	3
Other	1
TOTAL	7

The remaining nine persons are located in the Department of Natural Resources and Enviromental Control and are classified in three categories as shown in Table VII. The five scientists are geologists or hydrologists, which are professional positions requiring four-year degrees. The technician positions require a high school education as a minimum, and the two classified as "other" are secretaries.

TABLE VII

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Potable Water Section
Current (1976) Staffing Level

Position	1976
Scientist	5
Technician	2
Other	2
TOTAL	9

Accurate Workforce data in the number of Water Supply operators and personnel was not available, and Delaware does not have a certification program for operators.

C. Workforce Projections

Projected growth in the water supply program is expected to increase significantly over the next five years, doubling the current workforce levels. Within the Health Department, the overall staffing increase is anticipated to occur at an average annual rate of 21%, as indicated in Table VIII. Program professionals estimate that each of the current categories can be expected to double in its current requirements. They have also projected the need for engineers, probably chemical, environmental, and sanitary engineers, for the program within the next few years. These increased positions are all as a result of increased federal requirements under the Safe Drinking Water Act.

TABLE VIII

DELAWARE HEALTH DEPARTMENT

Potable Water Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer			1	2	3	5		72%
Sanitarian	3	4	5	5	6	6		16%
Technician	3	4	4	4	4	5		12%
Other	1	1	1	2	2	2		20%
TOTAL	7	9	11	13	15	18	N/A	21%

Personnel levels within the Department of Natural Resources and Environmental Control are expected to increase for the same reasons as those of the Health Department. As indicated in Table IX, each of the current job categories should increase at approximately the same rates.

TABLE IX

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Potable Water Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Scientist	5	6	7	8	9	11		17%
Technician	2	2	3	3	4	4		17%
Other	2	2	2	3	3	3		10%
TOTAL	9	10	12	14	16	18	N/A	15%

Because current workforce data on the number of Water Supply operators and personnel were not available and since no operator certification program exists, it is not possible to make projections for this category.

D. Training and Certification

The only training conducted by the Departments of Health and Natural Resources and Environmental Control are informal on-the-job programs for new personnel to familiarize them with the state's program and the requirements of the Safe Drinking Water Act. Program officials indicated that personnel are sent to outside training programs as often as possible, and this is sometimes a problem due to budgetary constraints. Water Supply operators attend, on a regular basis, the annual short course conducted by the American Water Works Association.

E. Career Potential

Projections indicate that career potential in potable water in Delaware will be significant. Within both the Department of Health and the Department of Natural Resources and Environmental Control, the programs are expected to double in staff size. Most of the opportunity will be for professionally trained persons, particularly engineers, sanitarians, and scientists such as biologists. There will also be some limited potential for non-professional persons trained as technicians.

F. Conclusion

The Potable Water Program in Delaware is divided between the Departments of Health and Natural Resources and Environmental Control Although the current workforce in the program is small, projections indicate that it will double in size over the next five years as a result of the Safe Drinking Water Act. Career opportunity is estimated to be best for persons professionally trained,with degrees in engineering or natural sciences.

Finally, although current staffing level figures for operators and laboratory personnel are currently unavailable, the mandates of SDWA and operator certification legislation will reveal the workforce members. Based on available information,it would be speculative to estimate either present levels or projections for water treatment and distribution systems.

V. RADIATION

A. Introduction

The Delaware Department of Health and Social Services, Division of Public Health has administrative responsibility for the state's radiation program through the Office of Radiation Safety. The Office is within the Bureau of Environmental Health, which is a component of the Community Health Section. The Authority on Radiation Protection is an advisory body to the program and has authority to adopt rules and regulations governing ionizing radiation. Created under Chapter 74, Title 16 of the Delaware Code, the Authority is made up of seven members but has no working staff of its own.

Delaware has a permissive state statute which grants it the right to enter into an agreement - state status with the Nuclear Regulatory Commission (NRC). The objective of NRC's cooperative activities with the States is to prepare them to take on greater responsibilities in controlling radioactive materials, establish coordination in considering nuclear power plant sites, and maintain open channels of communication to exchange advice and comment on nuclear matters of mutual interest. To date, Delaware has not obtained agreement - state status with NRC. As of the end of 1975, NRC had granted 55 licenses of By-product Source and Special Nuclear Materials within the state. User control regulations are provided for by a state statute.

At present, the radiation program is involved in limited environmental monitoring (inspection) activities. There are also no on-going

activities in the area of naturally occurring radiation, the largest single source of population exposure. Activities in the area of nuclear power and radioactive waste disposal are expected to pickup once construction plans for two nuclear power stations in the state advance beyond the review stage. In addition, concern over the New Jersey reactor, located on the Delaware River, only a mile from Delaware, will probably result in heightened activity in this area. The summary immediately below represents the status of the two nuclear electric generating plants currently in the planning stages in Delaware.

NUCLEAR ELECTRIC GENERATING UNITS PLANNED FOR DELAWARE

Plant Name	Capacity (Net MWe)	Type	Status	Utility	Scheduled Operation
Summit Power Station: Unit 1	770	HTGR	UR	Delmarva Power & Light Co.	1981
Summit Power Station: Unit 2	770	HTGR	UR	Delmarva Power & Light Co.	1984

UR: Under Review

B. Workforce Profile

At the state level, there are only two persons currently working in the radiation program. One is a physicist, and one is an X-ray technician. Both are primarily involved in X-ray inspection activities.

C. Workforce Projections

Professionals currently employed in the program anticipate an increase of seven or eight people at the state level by 1982. At least two more degreed radiological health professionals are needed by 1978, plus one on loan from the federal government and one secretary. This breakdown is depicted in Table X below.

TABLE X

DELAWARE DEPARTMENT OF HEALTH AND SOCIAL SERVICES

Office of Radiation Safety
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Scientist	1	1	3	3	3	3	NA	*
Technician	1	1	1	1	2	3	NA	
Sanitarian			1	1	1	1	NA	
Other			1	1	1	1	NA	
TOTAL	2	2	6	6	7	8	NA	*

* Because of the small number of positions, growth rates as calculated would not be realistic.

D. Training and Certification

Since there are only two persons at the state level working in radiation, no training programs, formal or informal, are offered. EPA's Office of Radiation Programs offers one course for professionals. This is an interagency course on emergency response planning conducted at the Defense Civil Preparedness Agency Staff College in Battle Creek,

Michigan and coordinated by the Nuclear Regulatory Commission (NRC). In addition to this course, ERDA/NRC offers a variety of films and self-instructional materials to state and local governments on the transportation of radioactive materials. The bulk of the radiation training programs offered to states are conducted by the NRC.

E. Career Potential

Career opportunities in radiation at the state and local levels in Delaware are expected to increase moderately over the next five years, with the greatest demand continuing to be for scientists, technicians, and radiological health professionals.

The real potential for careers in radiation will depend at least partially on the future of nuclear power facilities in the state. Once in operation, the power plants currently under review can be expected to provide a substantial number of jobs for nuclear engineers, scientists, and technicians. The development of nuclear power in Delaware will also affect the number of jobs available in radioactive waste disposal, since much of this waste in the future will be generated by nuclear facilities. Most of these jobs will be in private industry.

F. Conclusion

Although activities in the radiation program are quite limited at present, expansion is likely. Construction of the two proposed nuclear generating plants in the state will produce a need for trained professionals in the areas of nuclear power and radioactive

waste disposal. Adoption of standards for the control of naturally-occurring radiation at the federal level will likely have some impact on state radiation activities. Heightening of program activities in all areas of radiation control will also result in an increase in the workforce in both the public and private sectors.

VI. SOLID WASTE

A. Introduction

In 1975, the Delaware legislature enacted legislation creating the Delaware Solid Waste Authority and providing the state with comprehensive solid waste management services. These include the collection, transportation, disposal, and resource recovery of solid wastes. This legislation also transferred the licensing powers of the Department of Natural Resources and Environmental Control for hauling, conveying, and transporting of solid wastes to the new Authority. However, the Department of Natural Resources and Environmental Control retains regulatory control over the program.

The Authority is specifically charged with the development and implementation of a statewide solid waste management plan and the establishment of a program for the maximum recovery and reuse of materials and energy resources derived from solid wastes. The Authority consists of seven directors, appointed by the Governor, representing all geographical areas of the state, a manager, and staff. The Authority has the power to design, construct, own, and operate solid waste facilities or to contract for these services from other governmental authorities or private industry.

The primary method of solid waste disposal utilized in Delaware is the landfill. Under regulations adopted in 1974 by the Department of Natural Resources and Environmental Control, sanitary landfills are required to have a leachate collection, treatment, and disposal system, methods of venting decomposition gases, and a means of monitoring groundwater quality and decomposition gases. There are currently 29 sanitary

landfills in the state which meet the state standards. This figure shows a decrease in the number of landfills from the 33 reported in 1975 and the 39 in 1974. The location of the facilities as of 1975, is shown on a map following this section. Of the 29 current landfills, 18 (62%) are privately owned and operated and 11 (38%) are publicly owned and operated. As indicated on the map, approximately half of the facilities handle between 4,000 and 100,000 cubic yards of waste per year, and another third handles less than 4,000 cubic yards per year.

There is one resource recovery facility located in Delaware. It is a state project located in Wilmington, funded partially by $9 million grant from U.S. EPA. The objective of the project is to demonstrate the total reclamation concept, and several products will be generated by it. They include refuse derived fuel, which will be used by the Delmarva Power and Light Co., compost, ferrous metals, aluminum, non-ferrous metals, and glass. The capacity of the plant will be 500 tons per day and is expected to begin operation in 1980. The plant will accept municipal solid waste, digested sewage sludge, and selected light industrial wastes.

B. Workforce Profile

Information for this section was obtained primarily from on-site interviews with professionals working in the program and from materials and documents supplied by them.

Delware's solid waste program currently has a staffing level of nine persons. They are divided between the Solid Waste Authority and

the Division of Environmental Control of Delaware's State Department of Natural Resources and Environmental Control. Staffing levels for both agencies are combined in Table XI.

The Solid Waste Authority has a staff of six persons at the present. Two, including the Director, are engineers, with training in sanitary and chemical engineering. One is a planner, a professional position requiring a four-year degree in a physical or natural science or related field. The three remaining positions are clerical and classified the "other" category in the table.

In regulatory activities, the Division of Environmental Control employs three people, two of whom are engineers. One is a sanitary engineer and the other a chemical engineer. There are 57 field inspectors, who also provide support to the program. The remaining position is secretarial.

TABLE XI

STATE OF DELAWARE

Public Sector Solid Waste
Current (1976) Staffing Level

Position	1976
Engineer	4
Sanitarian	1
Other	4
TOTAL	9

Additional workforce in solid waste exists at the community level in landfill operations and waste collection and in the private sector in landfill operations, collection, and resource recovery. No readily available staffing configuration exists.

C. Workforce Projections

Data contained in this section are based on the best professional judgement of professionals working in the program and on planning materials they were able to supply.

Both the Solid Waste Authority and the Division of Environmental Control indicated that workforce levels are not likely to increase significantly over the next five years, as far as the creation of new jobs is concerned. As Table XII below indicates, there will be an anticipated doubling of current staffing levels and an average percentage increase per year of 19%. Because current staffing is low, even a doubling in size will not create many new positions.

Officials in the Solid Waste Authority expect an increase to 14 people over the next five years. The bulk will occur in 1980, which will coincide with the operational date for the state's resource recovery facility in Wilmington. This project, which was mentioned in the introduction, is expected to handle almost 70% of the state's total solid waste. Authority officials anticipate the addition of three more engineers, probably chemical or mechanical engineers, and two additional planners. The remaining personnel would be clerical. After 1980, the staffing level is expected to remain constant. Authority officials expressed their intent to develop only a small, technical in-house staff and contract out services as much as possible.

The Division of Environmental Control anticipates an increase to seven people within the next five years. Officials indicated that they expect the addition of one engineer, two technicans, and one clerical position.

Local and private sector workforce projections are difficult to obtain for much the same reasons that were discussed in the workforce profile section. The fact that local jurisdictions and industry operate independently of one another makes it virtually impossible to get an accurate projection. State officials did indicate, however, that they expect opportunities to be available for technical people with the operation, beginning in 1980, of the resource recovery facility.

TABLE XII

STATE OF DELAWARE

Public Sector Solid Waste
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	4	4	5	5	8	8		17%
Planner	1	1	2	2	3	3		30%
Technician			1	2	2	2		33%
Other	4	4	5	6	8	8		16%
TOTAL	9	9	13	15	21	21	N/A	20%

D. Training and Certification

The Division of Environmental Control has the responsibility for solid waste operator training in Delaware. The only formal program conducted is a short course provided once a year for operators. It is estimated that about ten people are in attendance at each course. No other training is offered by either the Division or the Solid Waste Authority, due to the small number of personnel in each agency.

Potential for future solid waste training activities exists under the recently enacted Resource Conservation and Recovery Act. The Act authorizes EPA to enter into grants or contracts for the development and implementation of programs to train individuals for occupations in solid waste management. It also authorizes funding for training instructors and supervisory personnel for the instruction and supervision of persons involved in the design, operation, and maintenance of solid waste disposal and resource recovery equipment and facilities. It is anticipated that this federal funding may serve as a catalyst for the state's solid waste training activities.

E. Career Potential

The potential for careers in solid waste management in Delaware appears to be limited at the state level. Although the program's staff size is expected to more than double over the next five years, few new jobs will be created, and the staffing will stablize at that level. With the beginning of operation of the state's resource recovery facility in 1981, opportunities will exist for operating personnel. There should also be opportunities developing in the private sector, since much of the state's activities will be contracted.

The careers will tend to move away from the conventional landfill and incinerator operators to more highly trained individuals for resource recovery operations. The opportunities will exist for engineers and scientists in the planning, design, and operation of these facilities. Although the demand for landfill operators is expected to

decline, a certain number of these positions will continue to exist in the foreseeable future, since resource recovery is not practical in many smaller communities and rural areas.

F. Conclusion

Delaware's Solid Waste Management activities are divided between the Solid Waste Authority and the Division of Environmental Control of the State Department of Natural Resources and Environmental Control. There is currently a total staff of nine full-time persons plus 57 part-time field inspectors working on the program with the expectation by program officials that the full-time staff will increase to 21 persons over the next five years.

The state's resource recovery facility is scheduled to become operational in 1980, and this, combined with federal involvement in Solid Waste Management and Resource Recovery, should lead to an increase in career potential and training activities.

DELAWARE SOLID WASTE DISPOSAL FACILITIES: 1975

Figure 4

A. LAND FILL SITES
LESS THAN 4,000 CUBIC YARDS PER YEAR
4,000 TO 100,000 CUBIC YARDS PER YEAR
100,000 OR MORE CUBIC YARDS PER YEAR
B. AREAS WITH COLLECTION SYSTEMS

Source: Division of Environmental Control, Department of Natural Resources and Environmental Control, State of Delaware

VII. WASTE WATER

A. Introduction

The waste water program in Delaware is under the jurisdiction of the Division of Environmental Control of the Department of Natural Resources and Environmental Control. The overall goal of the program is to improve or maintain water quality in the state's water to allow for water recreation activities, including fishing by 1983. The streams in Delaware are generally regarded to be too shallow and too small for swimming or water skiing except at specific locations. Most tidal streams are too narrow, shallow, and murky to be attractive for water based recreation. There are only six prime areas for water recreation in Delaware, and the state is making efforts to protect them.

The Environmental Protection Agency has delegated its authority to the Department of Natural Resources and Environmental Control for issuing the National Pollution Discharge Elimination System permits. All known discharges have received permits from the Department. The permits establish a timetable for meeting the State and Federal requirements of best practical control technology by July 1, 1977. Some municipal waste discharges cannot meet the deadline, because construction, already underway, will not be completed by that date. The permit requirements have eliminated a number of minor discharges. They are now either connected to wastewater collection and treatment systems or converted to another type of discharge e.g., spray irrigation.

Most of the streams in Delaware support propagation and maintenance of aquatic and wildlife. The major exception still continues

to be the Delaware River, as it flows into Delaware from the north, to the vicinity of the Chesapeake and Delaware Canal. Improvements in this section of the river are still dependent upon the upgrading of major industrial and municipal treatment facilities upstream in the states of Pennsylvania and New Jersey.

The elimination and/or control of point sources in steam basins have highlighted nonpoint sources both of man-made origin, as in the pollution load from urban and industrial areas, and of natural origin such as wildlife and waterfowl. During the remaining years of this decade, Delaware will concentrate on quantifying the effect of the nonpoint source problems and attempt optimum control strategy.

The state continues to have several areas of concern regarding water quality. The most pressing problem is contamination of ground water aquifers. There are numerous landfill areas in the State, and leachates from some of them has penetrated the ground water aquifers.

Another problem stems from the runoff from surrounding land which deposits nutrients and nutrient-bearing sediment into lakes and ponds. Excessive amounts of these nutrients result in the water bodies becoming eutrophic.

A third problem is the encroachment of urban development into the inland bays causing urban runoff contamination. Although the pace of growth has slowed down due to economic conditions, it is still continuing, and the potential is there for major growth when economic conditions improve.

B. Workforce Profile

The information contained in this section was obtained primarily through on-site interviews with professionals working in the waste water program and through various materials and documents supplied by them.

The activities of the Division of Environmental Quality in regard to waste water are concerned with carrying out the mandates of the Federal Water Pollution Control Act Amendments (FWPCA) of 1972. The activities, as outlined in Delaware's Fiscal Year 1977 Water Quality Program, include:

Municipal Facilities Construction

The primary goal of the Municipal Facilities Construction program is to achieve the most cost effective and timely abatement of municipal wastewater through the proper planning, design, and construction of treatment works.

The Municipal Facilities Construction Program includes:

1) Construction Grant Application Review,

2) Plans and Specifications Review,

3) Operation and Maintenance Manuals, and

4) Bid-tabulation and Change Orders.

Permits

A major effort was made in this program during FY 1976. All NPDES permits were issued by December 31, 1975. As of that date, there were 180 point source dischargers on the State's list. It should be noted that the number of point source dischargers is continually changing due to new applications and elimination of point sources through abatement actions.

Water Quality Management Planning

Major efforts in the last two years in Water Quality Management Planning have been 1) the development of Phase I, Basin Plans for the three basins within the State and 2) establishing the 201 and 208 planning processes at the local level. During

FY 1977 emphasis will be placed on the "continuing planning process." This includes:

1) nonpoint source inventory and analysis;

2) publication of annual supplements to the plans;

3) 208 Program Monitoring and Assistance - the State intends to provide technical and programmatic assistance, monitor progress and assure consistency with State Plans;

4) evaluation of 201 facility plans;

5) interstate coordination;

6) participation in Level B studies with Water Resources Regional Agency;

7) initiation of a comparative analysis of various State environmental and land use plans to the Basin plans.

Monitoring (Ambient & Effluent)

Delaware has maintained a strong program for ambient water quality monitoring for all major streams and many minor streams since 1951. The emphasis and priorities in this program are defined by continuing review processes such as the Water Quality Inventory Report and other similar evaluations. This is not a new program but one that is reinforced and modified as needed.

As various municipal and non-municipal dischargers have come under permit regulations, the surveillance emphasis has been shifted toward compliance monitoring. A continuing monthly sampling/analysis reconnaissance effort of all major liquid waste dischargers will be accomplished. This effort will be supplemented with monthly inspections of facility operations and outfalls. These monthly activities together with an annual detailed indepth review of major industrial dischargers will provide an accurate assessment of compliance with permit requirements.

A biological monitoring program has been underway for a number of years. This program is designed to supplement chemical/physical information and is an essential part of the overall strategy to define water quality. In FY 1977 the program will be expanded to the monitoring of the biological affects in the State's 21 major streams, assuming a minimum of two and a maximum of five samples, three times each year for each stream.

Intensive surveys are undertaken to define the impact of non-point sources (NPS) on an as needed basis. These surveys may be triggered by conclusions that are an outgrowth of the continuing

review of ambient water quality data, biological data, and discharger data. The NPS assessment aids in the identification of areas still in need of further improvements and provides input into the water quality surveillance network.

The laboratory provides the basic support for the surveillance network. The State's laboratory is well equipped to handle a broad range of tests and contains the latest sophisticated instrumentations. This equipment is supplemented with other instrumentation available at various university/college and Federal/State laboratories. This close support provides for the transfer, assimilation, and application of the latest technology to achieve established goals.

Data Handling

Delaware is in the process of developing a computer based water quality data system. This system has two major objectives. First of all it will provide a water quality data bank, and secondly, it will provide timely identification of water quality standard violations. In the long run it will handle and manipulate data for water quality trend analysis.

The whole system is divided into two major files consisting of stream water quality and point sources files. The stream water quality file contains all information pertinent to the Delaware Stream Water Quality Monitoring Network. The point source files contain all information pertinent to the portion of National Pollutant Discharge Elimination System under Delaware jurisdiction.

Compliance Assurance

Compliance assurance is actually a melding of monitoring, inspection and enforcement activities into one process. The purpose of this program is to provide close monitoring of compliance of permit conditions. Personnel in this program will assure that point sources are complying with State Regulations, Permits and Standards. Responsibility will be accepted by the State for compliance monitoring of the 26 NPDES permits issued by EPA within the State.

The current staffing level of the waste water program consists of 36 people in the Division of Environmental Control. They can be classified into five occupational categories as illustrated in Table XIII on the following page. The engineers are chemical and sanitary

engineers, with professional training in those disciplines. The two planners are professionals, with backgrounds in the physical or natural sciences. Those persons listed as technicans are not required to have a college degree, although some college training is considered desirable. The "others" category includes 11 secretaries, one attorney, and one personnel officer.

Accurate workforce data on the number of wastewater treatment plant operators and personnel were not available, and Delaware does not have a certification program for operators. It was estimated by program professionals, however, that there are about 250 operators in the state.

TABLE XIII

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
Division of Environmental Control
Waste Water Programs
Current (1976) Staffing Level

Position	1976
Engineer	12
Planner	2
Lab Technician	2
Technician	7
Other	13
TOTAL	36

C. Workforce Projections

Projected growth in the Waste Water Program is expected to be small, approximately 4% per year as shown in Table XIV. This would amount to nine additional people in the program. It was anticipated by program officials that most of the activity will be in enforcement. Increases are expected to occur in all categories with engi-

neers being the greatest in demand. Job requirements are not expected to differ over the next five years from current requirements.

Although an accurate projection of waste water treatment plant operators was not available, program officials indicated that the number of operators would likely increase from the approximated 250. at present by about 10-15 per year in each of the next five years.

TABLE XIV

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Division of Environmental Control
Waste Water Programs
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	12	12	13	13	15	15		5%
Planner	2	2	2	2	2	2		N/A
Lab Technician	2	2	2	2	2	2		N/A
Technician	7	7	9	9	11	11		10%
Other	13	13	13	13	15	15		3%
TOTAL	36	36	39	39	45	45	N/A	5%

D. Training and Certification

Delaware's efforts in training of waste water personnel, to date, have consisted of an informal on-the-job training program for new personnel within the Division of Environmental Quality and technical training to in-house personnel.

Over the next year, the State's training activities will increase considerably, according to program officials. The Division of Environmental Quality is currently working with higher education institutions

within the State to develop a training program for waste water treatment plant operators. Under the program currently planned, the actual training would be conducted by the educational institutions, with guidance and technical assistance provided by the state.

Additionally, the Division sends personnel to EPA sponsored training through EPA's Office of Water Programs Operations at the National Training Center in Cincinnati, Ohio. Subjects offered include waste water treatment technology, control of special pollution problems, and chemical analysis techniques.

E. Career Potential

Projections indicate that career potential in waste water in Delaware is limited. Within the state program, only nine additional positions are anticipated over the next five years. Although most of these will require professionally trained persons with backgrounds in engineering or the natural sciences, significant technician opportunities are expected to exist for those of whom do not have college degrees.

Although career potential for waste water treatment plant operators is not anticipated to be great, Delaware does have plans to institute a certification and training program for operators. This may serve to increase the potential through the upgrading of the position.

F. Conclusion

The waste water program in Delaware is relatively small. There are thirty-six people currently working in the program which is located in the state's Department of Natural Resources and Environmental Control. Projections indicate that the program can be expected to grow by about 4% per year over the next five years with an increasing demand for engineers and technicians.

Delaware has no operator certification or comprehensive training program at the present time. It is estimated that both of these activities will be initiated within the next year or two in an effort to upgrade the operations of wastewater treatment plants.

VIII. ENERGY

A. Introduction

Energy office functions in Delaware are administered jointly by the Division of Emergency Planning and Operations under the Department of Public Safety and the newly created Governor's Energy Commission. The Division of Emergency Planning and Operations has now become primarily responsible for fuels allocations whereas the Commission now has responsibility for energy conservation planning.

The Division of Emergency Planning and Operations was created by an enabling act of the Legislature to manage the state set-aside program and to prepare requests by petroleum users for base period adjustments. Since the changeover of the new administration in Delaware, the new Governor has taken energy conservation responsibilities from the Division and given them to the Commission's Executive Director. This person, as the Governor's Energy Advisor, serves on the Governor's Energy Commission along with members from the private sector to prepare ways to facilitate energy conservation in the state.

Delaware currently does not have nuclear power generators operating in the state although Delmarva Power and Light Company has two power station units under review for construction permits. These two 770 megawatt units are scheduled for completion in 1981 and 1984.

B. Workforce Profile

The director of the Division of Emergency Planning and Operations is the only person in the Division responsible for energy-related

planning functions and serves as Fuels Allocations Officer for the State of Delaware.

The Governor's Energy Advisor as Executive Director of the Governor's Energy Commission serves with the assistance of a secretary to promote energy conservation planning in Delaware. Delaware has submitted its proposed energy conservation plan to the U.S. Federal Energy Administration for approval. This plan may be approved in the next few months and is Delaware's response to the mandates expressed by the passage of the Federal Energy Policy and Conservation Act (EPCA). At the present time, Delaware has a total of three persons, i.e., the director of the Division of Emergency Planning and Operations, the Governor's Energy Advisor, and a secretary, involved with energy planning activities on the state level.

C. Workforce Projections

Assuming that the state's energy conservation plan is accepted by the Federal Energy Administration and funds are made available to hire additional personnel for plan implementation, it is expected by state representatives that Delaware will require four persons to implement its plan. These persons would most likely be planners and assistant planners with college and managerial backgrounds. It is not likely that the persons hired for the plan would necessarily be urban planners.

D. Training and Certification

Because of the small number of persons involved and the newness of the program, Delaware's energy effort does not have any formal training programs. Materials for public use concerning energy conservation are being prepared.

E. Career Potential

The state energy conservation plan may lead to some limited career potential for public sector energy employees. Energy planners are the most likely to be recruited.

F. Conclusion

Delaware currently has a very small public energy agency. With increased emphasis on conservation, a greater educational effort and small workforce expansion can be expected.

Selected Post Secondary Institutions With Formal Environmental Energy Programs

Career options in environmental studies are limited in availability within the post-secondary educational institutions in Delaware. The Delaware Technical and Community College, Stanton Campus, offers an associate degree in Environmental Engineering Technology. The program, which was implemented in 1971, stresses a variety of environmental disciplines. Introductory and advanced courses are offered in solid waste management, pollution analysis, and environmental health. An area of special emphasis is environmental process design. Students are required to enroll in Environmental Control Process Design I and II, as well as complete an environmental systems design project.

The University of Delaware, located in Newark, awards a Master of Education degree in Population and Environmental Education. The Master's program,which was organized in 1972,requires a minimum of 30 semester hours for a degree. In addition, students are required to pass a comprehensive examination based upon the entire education program. Complete individual degree programs may be planned for the student whose needs and career aspirations are not well served by the regular program.

The University of Delaware in coordination with the Office of Coastal Zone Management and the Delaware Sea Grant College Program has developed a series of Coastal/Oceanic Awareness Study Programs. The materials prepared for these programs represent a multidisciplinary collection of learning experiences designed to increase knowledge about the marine and coastal environments. These materials were prepared for use by kindergarten through twelfth grades. There are four fundamental training

components: 1) An Abundance of Water Makes the Earth Unique in Our Solar System; 2) The Oceans Interact with the Earth and its Atmosphere; 3) Marine Organisms Interact in Complex Ecosystems; and 4) Man is Part of the Marine Ecosystem. At the writing of this report, over 100 resources are available through the College of Education, University of Delaware.

Most post-secondary educational institutions in the state offer individual courses in environmental disciplines; however, other than the two programs previously mentioned, environmental degree programs are rare.

The following section in this report will provide a basic review of the programs available through Delaware Technical and Community College and the University of Delaware. The review will include statistics on student enrollment, degree requirements, and course offerings.

SENIOR INSTITUTIONS

University of Delaware
Newark, Delaware

Program: Population and Environmental Education (M.Ed.)

Hours required for major: Semester - 30
Program Inception: 1972
Staff Size: One professor (1 Ph.D.)
Enrollment: 12
Graduates (1976): 2
Placement: 2
Graduate Work: 0

Courses

Not available at this time

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

Delaware Technical and Community College (Stanton Campus)
Dover, Delaware

Program: Environmental Engineering Technology (A.S.)

Hours required for major: Quarter - 115
Program Inception: 1971
Staff Size: From three to six instructors all with M.S. degrees.
Enrollment: 45
Graduates (1976): 7
Placement: 2
Graduate Work: 1

Courses

Introduction to Environmental Engineering
Environmental Microbiology I
Solid Waste Management
Environmental Control Process Design I
Environmental Chemistry I, II
Community Air Pollution
Environmental Control Process Design II
Communicable Disease Prevention
Industrial Waste Treatment
Environmental Health Physics
Instrumental Methods of Pollution Analysis
Environmental Systems Design Project
Environmental Research Project

State Legislation

DELAWARE GENERAL

TITLE:

Environmental Protection Act
Delaware Code 7-6001

PURPOSE:

To manage the land, water and air resources of the state, and to control pollution thereof.

DEFINITIONS:

1. Activity
2. Air contaminant
3. Air pollution
4. Board
5. Department
6. Garbage
7. Groundwater
8. Hazardous waste
9. Industrial waste
10. Liquid waste
11. Liquid waste hauler
12. Liquid waste treatment plant operator
13. Oil
14. Other wastes
15. Person
16. Pollutant
17. Refuse
18. Rubbish
19. Secretary
20. Sewage
21. Solid waste
22. Surface water
23. Variance
24. Water facility
25. Water pollution
26. Water well contractor

ADMINISTERING AUTHORITY:

Department of Natural Resources and Environmental Control

AUTHORIZATIONS:

To issue permits for air and water discharges;
To issue permits for solid waste activities and highway construction;
To issue regulations pursuant to the act;

AUTHORIZATIONS (Cont'd):

To enforce the act;
To grant variances under the act;
To supervise solid waste activities in the state;
To license well contractors, septic tank, and liquid waste operating personnel.

PROHIBITED ACTS:

To fail to obtain any permit as required;
To interfere with enforcement of the act;
To violate any regulations under the act.

PENALTIES:

Criminal - fines of from $50 to $500 per day, fines of from $2,500 to $25,000 per day if willful;
Civil - fines of from $1,000 to $10,000 per day; liability also imposed for cleanup and abatement expenses.

DELAWARE NOISE

TITLE:

Noise Control Act
Delaware Code 7-7101

PURPOSE:

To provide for the control and abatement of noise levels which degrade the quality of life and endanger the health, safety and welfare of people of the state.

DEFINITIONS:

1. Council
2. Farming operation
3. Manufacturer
4. Motor vehicle
5. Noise
6. Person
7. Secretary

ADMINISTERING AUTHORITY:

Department of Natural Resources and Environmental Control
Noise Control Council
Department of Public Safety

AUTHORIZATIONS:

To issue regulations pursuant to the act and adopt noise standards;
To conduct noise hazard studies;
To register excessive noise operations;
To enter and inspect property in enforcement of the act;
To review highway corridor plans;
To enforce the act;
To adopt motor vehicle noise regulations;
To make noise control recommendations;
To submit annual reports.

PROHIBITED ACTS:

To violate any noise standards or regulations;
To interfere with enforcement of the act.

EXEMPTIONS:

Farming operations.

PENALTIES:

Motor vehicle violations - fines of from $25 to $1,000.

DELAWARE PESTICIDES

TITLE:

Pesticide Law
Delaware Code 3-12

PURPOSE:

To provide for the control and safe use of pesticides through a program of registration and certification of applicators.

DEFINITIONS:

1. Active ingredient
2. Adulterated
3. Antidote
4. Commercial pesticide
5. Applicator
6. Department
7. Desiccant
8. Device
9. Fungi
10. Fungicide
11. Herbicide
12. Inert ingredient
13. Ingredient statement
14. Insect
15. Insecticide
16. Labeling
17. Misbranded
18. Mite
19. Miticide
20. Nematode
21. Person
22. Pesticide
23. Plant regulator
24. Registrant
25. Restricted use pesticide
26. Rodenticide
27. Secretary
28. Structural pesticide applicator
29. User
30. Weed

ADMINISTERING AUTHORITY:

Department of Agriculture
Pesticide Advisory Committee

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To regulate the storage and disposal of pesticides;
To restrict pesticide usage;
To enforce the act;
To license pesticide dealers;
To establish certification standards;
To categorize commercial applicators;
To certify commercial and private applicators;
To issue experimental use permits;
To require pesticide registration.

CERTIFICATION OR LICENSING:

Commercial and private applicators must be certified;
Permit required for restricted pesticide purchase;
Dealers must be licensed;
Categories established include structural and commercial applicators.

PROHIBITED ACTS:

To purchase restricted use pesticide without permit;
To sell pesticides without dealer license;
To dispose of pesticides in violation of regulations;
To fail to register pesticides;
To violate the terms of any applicator certificate.

PENALTIES:

Fines of up to $5,000.

DELAWARE SOLID WASTE

TITLE:

Solid Waste Authority Act
Delaware Code 7-64

PURPOSE:

To provide for a comprehensive program of solid waste management, maximum resource recovery, and protection of state environmental resources.

DEFINITIONS:

1. Authority
2. Department
3. Facility
4. Groundwater
5. Person
6. Resources recovery
7. Resources recovery systems
8. Revenues
9. Solid waste
10. Solid waste management service
11. Surface water
12. Users
13. Volume reduction

ADMINISTERING AUTHORITY:

Delaware Solid Waste Authority
Department of Natural Resources and Environmental Control

AUTHORIZATIONS:

To issue regulations pursuant to the act;
To plan, construct and operate solid waste disposal, volume reduction and resource recovery facilities;
To provide solid waste management service to local governmental units;

AUTHORIZATIONS (Cont'd):

To license solid waste transporters;
To take actions necessary to carry out the act;
To enter and inspect property in enforcement of the act;
To develop solid waste management plans.

PROHIBITED ACTS:

To violate any act provisions or regulations.

PENALTIES:

Fines of from $100 to $1,000.

DELAWARE WASTE WATER

TITLE:

Coastal Zone Act
Delaware Code 7-7001

PURPOSE:

To control the location, extent and type of industrial development along the state's coastal areas.

DEFINITIONS:

1. The coastal zone
2. Nonconforming use
3. Environmental impact statement
4. Manufacturing
5. Heavy industry use
6. Bulk product transfer facility
7. Person
8. Board

ADMINISTERING AUTHORITY:

State Planning Office
Coastal Zone Industrial Control Board

AUTHORIZATIONS:

To issue permits for coastal zone development;
To consider the environmental impact of any development;
To administer the act;
To issue cease and desist orders.

PROHIBITED ACTS:

To fail to obtain permit as required;
To violate other act provisions.

PENALTIES:

Fines of up to $50,000.